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LASER SPECTRUM ANALYZER

TL

TL Series

R&D AND MANUFACTURING



Most precise laser spectral analysis available

- High spectral resolution with finesse greater than 150
- Variable free spectral range for optimum performance with virtually any laser
- Interchangeable mirrors for operation from 550 nm to 1.8 µm
- Automatic spectral analysis with optional NuView software
- System comes complete with everything necessary
- Programable ramp generator to maximize measurement precision
- Optional fiber-optic coupling

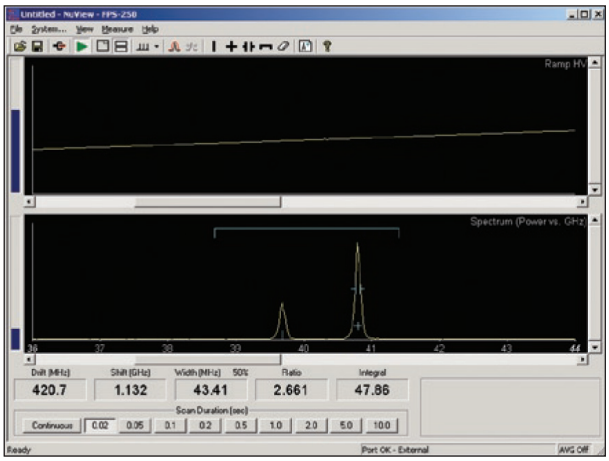
High-Performance Analysis of a Variety of Lasers

EXFO 's TL Series laser spectrum analyzer provides the most convenient spectral characterization of lasers with large bandwidths or range of frequencies. With a free spectral range of 15 to 1500 GHz, the TL Series easily measures the spectral features of virtually any CW laser operating at wavelengths from 550 nm to 1.8 µm. With a finesse greater than 150, the TL system provides the highest spectral resolution available.

Variable Free Spectral Range

The TL Series laser spectrum analyzer utilizes a piezoelectrically scanned, plano-mirror Fabry-Perot interferometer to provide the free spectral range required for the analysis of broadband lasers. Unlike confocal mirror laser spectrum analyzers that have a fixed free spectral range that is typically less than 10 GHz, the TL Series has a discretely variable free spectral range that is as large as 1500 GHz. This provides the capability of optimizing the free spectral range with respect to virtually any laser to maximize resolution without overlapping interference orders.

The mirrors of the TL Series laser spectrum analyzer are separated by a thermally stable Invar spacer, the thickness of which determines the system's free spectral range. Standard Invar spacers with different thicknesses are available, allowing seven options for free spectral range between 15 and 1500 GHz. You simply choose the model with the free spectral range that is appropriate for your application. The optional TL-150 Invar spacer set lets you change the free spectral range of the system to any of the available choices.



NuView spectrum display shows the spectral characteristics of a HeNe laser.

Operates from 550 nm to 1.8 µm

The TL Series laser spectrum analyzer offers the flexibility of interchangeable mirrors for operation anywhere from 550 nm to 1.8 µm. To achieve a finesse of greater than 150, the mirrors have a multi-layer dielectric coating with a nominal reflectivity of 99.7%. A standard wavelength range from 1.30 to 1.50 µm is available to work with lasers used for optical fiber communications.

Laser Spectral Analysis Software – FPS-250 NuView

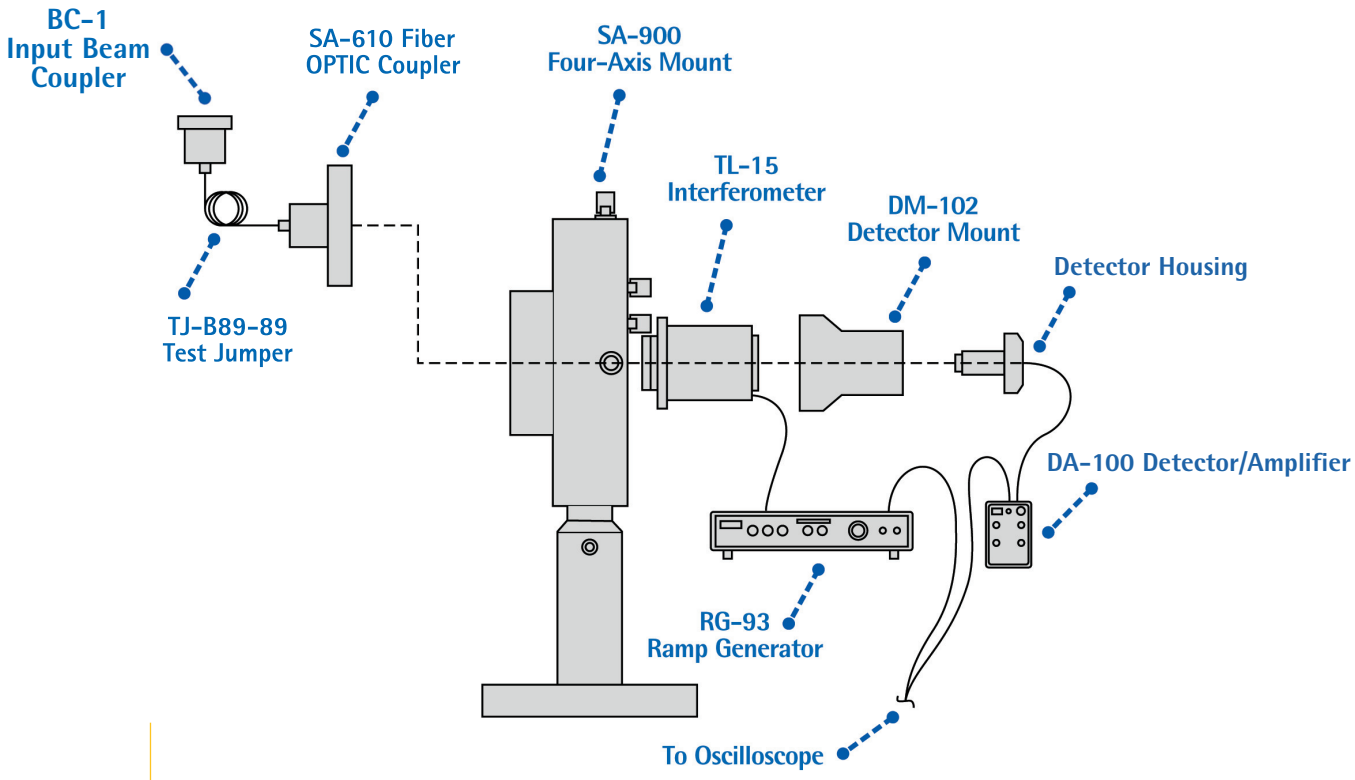
FPS-250 NuView turns a PC into a sophisticated oscilloscope-like device for completely automatic laser spectral analysis. Used with a Fabry-Perot interferometer-based laser spectrum analyzer, FPS-250 software conveniently measures spectral characteristics such as laser linewidth, longitudinal mode structure and frequency stability. The result is a better understanding of laser performance and therefore more meaningful experimental results.



FPS-250 NuView

Laser Spectral Analysis Made Easy

EXFO not only provides the highest performance laser spectrum analyzers, but it also makes laser spectral analysis easy. The TL Series laser spectrum analyzer includes all the components necessary for routine operation with virtually any CW laser. Alignment of the laser under test is simple using a four-axis mount (X-Y-Θ-Φ to precisely position the interferometer. All that 's left to do is connect your oscilloscope to view the output.



With TL Series laser spectrum analyzers, alignment of the incoming beam is simplified using a four-axis mount to precisely position the interferometer. Straightforward adjustments using the RG-93 ramp generator provide convenient control of all piezoelectric scanning functions.

High-Performance Ramp Generator

The RG-93 is a three-channel ramp generator that provides the voltage required to piezoelectrically scan the interferometer of the TL Series laser spectrum analyzer. This system provides convenient controls to adjust the range, zero offset and rate of the ramp voltage. In addition, the RG-93 provides three independent DC bias signals for fine control of the alignment of the plano mirrors. The slope of the ramp for the three output channels can also be adjusted independently to ensure tilt-free scanning. The RG-93 ramp generator also includes an adjustment to shape the ramp voltage in such a way as to correct for the inherent non-linear motion of the piezoelectric transducer. External input also can be accepted for custom control of the interferometer in special applications.

High-Sensitivity Detector/Amplifier

The DA-100 detector/amplifier detects the laser light transmitted through the interferometer of the TL system, and then amplifies the signal for display. The photodetector is interchangeable for operation with the visible to the infrared wavelength ranges. Its superior low noise performance detects signals as low as 1 nW in order to minimize the laser intensity required for laser spectral analysis. Convenient packaging and self-explanatory controls result in straight-forward operation.

Optional Fiber-Optic Coupling

The TL Series laser spectrum analyzer can be enhanced further with fiber-optic input that simplifies the coupling of the laser under test into the interferometer.

SPECIFICATIONS

TL Series Interferometer

Cavity design	Plano mirror geometry
Free spectral range (FSR)	15 GHz, 30 GHz, 75 GHZ, 150 GHz, 300 GHz, 750 GHz, 1500 GHz
Finesse	> 150 (for λ < 1000 nm) or > 200 (for λ > 1000 nm)
Minimum resolvable bandwidth	FSR/Finesse
Wavelength range	Custom ranges from 550 nm to 1.8 µm
Mirror reflectivity	99.3% (+/-0.5%) nominal
Transmission	> 10 %
Input aperture	1 mm
PZT scan distance	2 µm/1000 V
PZT non-linearity	< 1 %
Scan non-linearity[1]	< 0.1 %
Construction	Thermally compensated re-entrant design

DA-100 Detector Amplifier

Bandwidth	0.3 to 100 kHz (0.3 to 20 kHz at maximum gain)
Sensitivity	0.1 V/mW to 1 V/µW, continuously variable
Minimum detectable power	Silicon –1 nW at 633 nm, Germanium –2 nW at 1.5 µm
RMS noise	< 1 mV
Offset adjust	± 1 V
Output signal	0 to ± 6 V, 200 Ω impedance (polarity is invertible)
Dimensions and weight	
Dimensions (H x W x D)	57 mm x 89 mm x 152 mm (2 1/4 in x 3 1/2 in x 6 in)
Weight	0.45 kg (1 lb)
Power requirements	9 V battery

RG-93 Ramp Generator

Ramp voltage	
Amplitude	0 to 1000 V (continuously variable)
Bias	0 to 1000 V (continuously variable)
High voltage output	Amplitude + bias (1000 V maximum)
Current	4 mA maximum
RMS noise	< 30 mV
Duration	20 ms to 10 s (switch selectable)
Output slew rate	1 V/µs
Retrace	20 ms duration
External input	0 to 10 V (gain variable from 0 to 100)
Ramp non-linearity	0.25 % (10–90 %)
Slope trim	0 to 15 % slope reduction
Independent PZT bias	
Voltage	0 to 525 VDC per channel
Output currant	2 mA maximum per channel
RMS Noise	< 30 mV
Output signals	
Blanking	0 V during ramp, –10 V during retrace
Output ÷ 100	0 to 10 V
Dimensions and weight	
Dimensions (H x W x D)	114 mm x 433 mm x 343 mm (4 1/2 in x 17 in x 13 1/2 in)
Weight	3.6 kg (8 lb)
Power requirements	100 to 240 VAC, 50/60 Hz

TL Accessories Available

TL-150	Invar spacer set
SA-610	Fiber-optic coupler
BC-1	Input beam coupler
TJ-B89-89	FC/UPC to FC/UPC 9/125 µm 3M test jumper
FPS-250	NuView laser spectral analysis software

NOTE: 1. With electronic compensation provided by the RG-93 ramp generator

ORDERING INFORMATION

(Mirror Set)

TL-115-XX-XX

Wavelength range
- 07 = 550-650 nm
- 08 = 650-750 nm
- 09 = 750-890 nm
- 10 = 850-990 nm
- 11 = 980-1145 nm
- 12 = 1150-1345 nm
- 13 = 1300-1550 nm
- 14 = 1425-1675 nm
- 15 = 1550-1800 nm

Nominal reflectivity
- 99 = 99 % nominal reflectivity

Example: TL-115-07-99

(Laser Spectrum Analyzer)

TL-15-XX-XX-XX

Free spectral range
- 0015 = 15 GHz
- 0030 = 30 GHz
- 0075 = 75 GHz
- 0150 = 150 GHz
- 0300 = 300 GHz
- 0750 = 750 GHz
- 1500 = 1500 GHz

Wavelength range
- 07 = 550-650 nm
- 08 = 650-750 nm
- 09 = 750-890 nm
- 10 = 850-990 nm
- 11 = 980-1145 nm
- 12 = 1150-1345 nm
- 13 = 1300-1550 nm
- 14 = 1425-1675 nm
- 15 = 1550-1800 nm

Nominal reflectivity
- 99 = 99 % nominal reflectivity

Example: TL-15-0015-11-99

EXFO Corporate Headquarters > 400 Godin Avenue, Quebec City (Quebec) G1M 2K2 CANADA | Tel.: 1 418 683-0211 | Fax: 1 418 683-2170 | info@EXFO.com

Toll-free: 1 800 663-3936 (USA and Canada) | www.EXFO.com

EXFO America	3701 Plano Parkway, Suite 160	Plano, TX 75075 USA	Tel.: 1 800 663-3936	Fax: 1 972 836-0164
EXFO Europe	Omega Enterprise Park, Electron Way	Chandlers Ford, Hampshire S053 4SE ENGLAND	Tel.: +44 2380 246810	Fax: +44 2380 246801
EXFO Asia	151 Chin Swee Road, #03-29 Manhattan House	SINGAPORE 169876	Tel.: +65 6333 8241	Fax: +65 6333 8242
EXFO China	No.88 Fuhua, First Road Central Tower, Room 801, Futian District	Shenzhen 518048, CHINA	Tel.: +86 (755) 8203 2300	Fax: +86 (755) 8203 2306
	Beijing New Century Hotel Office Tower, Room 1754-1755 No. 6 Southern Capital Gym Road	Beijing 100044 P. R. CHINA	Tel.: +86 (10) 6849 2738	Fax: +86 (10) 6849 2662

EXFO is certified ISO 9001 and attests to the quality of these products. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. EXFO has made every effort to ensure that the information contained in this specification sheet is accurate. All of EXFO's manufactured products are compliant with the European Union's WEEE directive. For more information, please visit **www.EXFO.com/recycle**. However, we accept no responsibility for any errors or omissions, and we reserve the right to modify design, characteristics and products at any time without obligation. Units of measurement in this document conform to SI standards and practices.
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Printed in Canada 07/07

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